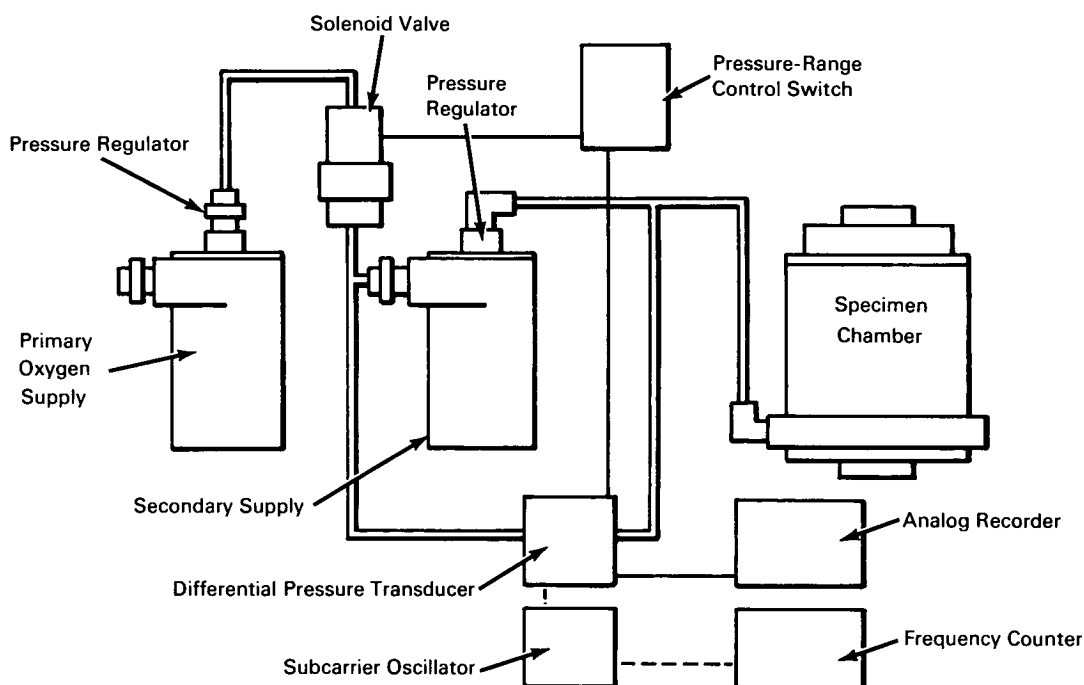


NASA TECH BRIEF



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Plant Respirometer Enables High Resolution of Oxygen Consumption Rates



The problem:

To devise an apparatus that will permit high resolution of relatively small changes in the rate of oxygen consumed by plant organisms undergoing oxidative metabolism in a nonphotosynthetic state.

The solution:

A two-stage supply and monitoring system consisting of primary and secondary oxygen supply chambers, a chamber for the plant specimen, a solenoid valve in the supply line between the primary and secondary chambers, a differential pressure transducer between the secondary supply chamber and the specimen chamber, and a pressure-range control switch

connected between the differential pressure transducer and the solenoid valve. The output from the differential pressure transducer, representing the relatively small changes in the oxygen consumption rate, may be read out as an analog signal on a strip chart recorder or as a digital signal by means of a frequency counter.

How it's done:

The primary chamber is charged with a sufficient supply of oxygen to provide for the metabolic needs of the plant organism during the investigative period. A pressure regulator maintains the outlet pressure

(continued overleaf)

from this supply at approximately 820 mm Hg absolute. The solenoid valve controls the flow of oxygen from the primary to the secondary supply chamber. The outlet pressure regulator from the secondary supply chamber is set to maintain a constant pressure of 770 mm Hg absolute in the specimen chamber. The differential pressure transducer provides an output signal ranging from 0 to 5 vdc for a differential pressure range of 0 to 0.3 psi. The dc output signal triggers a specially developed solid state switch for opening the solenoid valve when the pressure differential between the specimen chamber and the secondary supply chamber approaches zero. This valve remains open, allowing oxygen to flow from the primary to the secondary supply chamber, until a pressure differential of 0.3 psi (786 mm Hg absolute pressure in the secondary chamber and 770 mm Hg absolute pressure in the specimen chamber) has been reestablished, at which time the valve is automatically closed. The 0 to 5 vdc signal from the differential pressure transducer is also fed to an analog recorder or used to modulate a subcarrier oscillator connected to a frequency counter. The recorder or counter is

calibrated to give a readout of the rate of oxygen consumption in the specimen chamber corresponding to the rate of pressure change in the secondary supply chamber.

Note:

Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Headquarters
National Aeronautics and Space
Administration
Washington, D.C. 20546
Reference: B66-10406

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Donald L. Foster
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